Part 3 of 10

FINAL

PERMIT MEMORANDUM 1998-117-C (PSD) 11

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

MEMORANDUM **April 16, 2001**

TO: Dawson Lasseter, P.E., Chief Engineer, Air Quality Division

THROUGH: Phillip Fielder, P.E., Interim Engr. Manager, New Source Permits Unit

THROUGH: Eric Milligan, E.I., New Source Permits Unit

THROUGH: Peer Review

FROM: David Schutz, P.E., New Source Permits Unit

SUBJECT: Evaluation of Permit Application No. **1998-117-C (PSD)**
Wynnewood Refining Company
Wynnewood, Garvin County, Oklahoma
906 S. Powell
Located Immediately South of Wynnewood on US-77

SECTION I. INTRODUCTION

Wynnewood Refining Company (WRC) operates a petroleum refinery (SIC 2911) in south-central Oklahoma. The facility has entered into Consent Order No. 99-400 regarding a violation of the current permit limits for PM_{10} emissions from the facility's Fluid Catalytic Cracking Unit (FCCU) catalyst regenerator. The application seeks authorization for added emissions of 352 TPY PM_{10} until December 31, 2002, while keeping existing emissions limitations unchanged for other pollutants. The project will be a major modification to an existing major source under Prevention of Significant Deterioration (PSD) criteria.

PSD states in OAC 252:100-8-32(1)(B), "When a source or modification becomes major solely by virtue of a relaxation in any enforceable permit limitation established after August 7, 1980, on the capacity of the source or modification to emit a pollutant, such as a restriction on hours of operation, then the requirements of 252:100-8, Parts 1, 3, 5, and 7 shall apply to that source or modification as though construction had not yet commenced on it." This project is subject to PSD because the relaxed emissions limitations of PM_{10} are greater than the PSD levels of significance for an existing PSD-major source. Full PSD review is required for PM_{10} emissions. Full PSD review of emissions consists of the following: a determination of best available control technology (BACT); an evaluation of existing air quality and determination of monitoring requirements; an evaluation of PSD increment consumption; an analysis of compliance with National Ambient Air Quality Standards (NAAQS); an evaluation of source-related impacts on growth, soils, vegetation, visibility; and a Class I area impact evaluation.

Current active permits for the refinery include Permits No. 73-004-O, 74-103-O, 75-001-O, 75-002-O, 75-003-O, 78-051-O (M-3), 82-064-O, 85-040-O, 86-026-O, 88-100-O, 89-012-O, 89-018-O, 91-037-O, 91-120-O, 91-164-O, 92-045-O, 93-001-O, 93-009-O, 93-041-O, 93-114-O, 93-217-O, 96-175-O, 96 -491-O, and 96-511-O. Permit No. 78-051-O (M-3) currently affects the FCCU regenerator.

This permit will affect only the FCCU catalyst regenerator stack. Emissions limitations for associated units were not specified at initial permitting, in any subsequent permit modification, nor the Consent Order. Appropriate emissions limitations for the associated units will be specified in the facility's Title V operating permit.

Item 2H of Consent Order No. 99-400 states that the operator must provide a schedule for milestones of progress ***following*** approval of BACT. Since BACT can be approved only by public review, the permit will incorporate a requirement to provide a schedule of milestones of progress subsequent to issuance of this permit.

SECTION II. FACILITY DESCRIPTION

The refinery converts crude oil into a variety of liquid fuels, solvents, asphalt and lubricants. Operations at the facility are divided into four categories: storage tanks, process units, utilities and auxiliaries, and blending and loading. The facility includes 20 process units for distillation and chemical reaction operations, 107 storage tanks, 40 combustion units, 4 additional combustion units operated for controlling air pollution emissions, product and raw material loading/unloading units, and auxiliary units for waste handling. Facility capacity is 54,000 barrels per day crude oil input. Crude oil arrives primarily by pipeline and also by truck and rail.

A. Process Units

There are 25 separate processing operations identified by the Wynnewood Refinery process flow diagram. These operations are identified as the No. 1 Crude Unit, No. 2 Crude Unit, Straight Run Stabilizer, Merox Unit, No. 1 Splitter, No. 2 Splitter, Naphtha Unifiner, Hydrogen Plant, Hysomer Unit, Crude Vacuum Unit, ROSE (Residual Oil Supercritical Extraction) Unit, CCR (Continuous Catalyst Regeneration) Platformer, Hydrocracker, Fluid Catalytic Cracking Unit, Plat Depropanizer, Deisobutanizer, Olefins Treater, Propylene Splitter, Alkylation Unit, Fuel Gas Treater, Fuel Gas Drum, Asphalt Oxidizer, Asphalt Blending, Distillate Blending, and Gasoline Blending. The refinery also operates gasoline, distillate, asphalt, LPG (liquefied petroleum gas), NaSH (sodium hydrosulfide), solvent, and slurry loading facilities and steam and utility systems.

Crude oil processing begins at the No. 1 and No. 2 Crude Units. First, salt, water, and inorganic particles are separated from crude oil. The distillation process follows. With distillation, the crude is divided into several fractions depending on boiling point of the hydrocarbons present. Streams from the Crude Units include light hydrocarbons (methane, ethane, propane, butane) which become refinery fuel gas and liquefied petroleum gas (LPG), straight run gasoline, naphtha, distillate, and residual streams such as gas oil and reduced crude. The residual oil, referred to as "reduced crude," is first processed in the Crude Vacuum Unit where additional gas oil is distilled out at reduced pressures. The gas oils from the crude units and the vacuum unit are the primary feeds to the Fluid Catalytic Cracking Unit (FCCU).

As an intermediate step, some of the vacuum bottoms are processed for removal of asphaltenes/resins in the ROSE (Residual Oil Supercritical Extraction) Unit before proceeding to either the Asphalt Oxidizer or FCCU.

The FCCU heats residual hydrocarbons to 900-1,000°F in the presence of a silica-based catalyst to convert the "gas oil" into lighter components. The large organic molecules break into smaller components. Most of these lighter components (about 60%) are recovered for gasoline blending.

Other lighter components are recovered as reactants for other refinery processes, fuel gas, olefins, or LPG. Heavy oil off the bottom of the unit is sold as slurry oil. Some of the organic materials become "coke" on the surface of the catalyst that is regenerated by burning off the coke before re-circulating the catalyst back to the FCCU.

Some of the light naphtha is processed by the "CCR Platformer Unit." "CCR Platformer" is a shortened form of "continuous catalyst regeneration platinum catalyzed aromatic formation" which converts naphtha into aromatic components of gasoline such as benzene, ethyl benzene, toluene, and xylene. Other gasoline blending components are prepared by combining smaller organic components in the LPG range into heavier components. Olefins separated from the processes (mostly as products of the FCCU) are reacted in the presence of hydrogen fluoride (HF) to form larger heptane and octane molecules.

Sulfur must be removed from sour refinery fuel gas, blending components, and reactants which will become blending components. WRC treats refinery fuel gas by controlled contact and chemical reaction with sodium hydroxide (NaOH). The product of the reaction (NaSH) is generally sold to the pulp paper industry. Some distillates are processed by a "Merox" unit, in which high-strength sodium hydroxide reacts with mercaptans and converts them to disulfide oils which remain in the product. Light naphtha is treated in a "Unifiner" Unit. "Unifining" is equivalent to hydrodesulfurization, where hydrogen gas is used to react with hydrocarbons, breaking off sulfur as hydrogen sulfide and lesser amounts of other Total Reduced Sulfur (TRS) compounds such as methyl sulfide. Hydrotreating also converts larger olefins into aliphatic hydrocarbons and naphthas which are not prone to form gummy resins during storage. An amine unit is used to further reduce the H_2S content of some of the fuel gas.

Hydrotreating requires large amounts of hydrogen gas to be created. Most of the hydrogen is created by "steam reforming." Here, steam is mixed with hydrocarbons such as methane in a

reaction such as $CH_4 + H_2O \rightarrow H_2 + CO_2$. The Platformer Unit also creates a large amount of hydrogen gas. Unreacted hydrogen gas is vented from units into the Refinery Fuel Gas system.

In addition, this refinery includes a "Hysomer Unit." This unit is commonly referred to as an "Isomerization Unit," which changes the molecular structure of organic compounds into ones more favorable to gasoline blending. This refinery also operates a hydrocracker. Similar to the FCCU, this unit cracks larger molecules into ones in the size range for gasoline blending.

For compliance purposes, the facility has reorganized the 25 process units into 10 process unit areas that also includes associated tankage. This is allowed under 40 CFR 63 Subpart CC.

B. Storage Tanks

There are 107 storage tanks at the refinery. Of these, 27 are pressure vessels operated with only fugitive emissions. The other 80 are operated at atmospheric pressure. Most of the tanks store organic liquids, but hydrogen fluoride (HF) and hydrogen chloride (HCl) are also stored.

There are several rules and regulations affecting storage tanks, depending on liquid stored, capacity, vapor pressure, hazardous air pollutant (HAP) concentrations, and date of construction/reconstruction. The tanks' designs are internal floating roof, external floating roof, vertical cone roof, and horizontal.

These tanks include raw material storage, product storage, and storage for intermediates. Having intermediate storage allows various process units to keep operating when upstream or downstream units are down or operating at reduced capacity. The presence of intermediate storage allows for delineation between process units as necessitated by NSPS Subpart GGG and 40 CFR Part 63 Subpart CC.

C. Utility Operations

Utility operations provide fuel and steam heat to various operations, and allow for discharge of waste.

Refinery fuel gas is a blend of natural gas, non-condensable gases, gases from relief valve discharge, unit purges, and a variety of process unit off-gases. A wide spectrum of gases generated in the refinery which are combustible become refinery fuel gas. These gases are combined in a single fuel mix drum for supply to all units within the refinery. Ideally, the refinery would generate the same amount of fuel gas as is needed, but in reality, fluctuations result in purchasing natural gas and in flaring excess fuel gas. The fuel gas averages 1,150 BTU/SCF heating value.

The mix drum blends three streams, "sweet" from the platformer, "sour" from other units, and pipeline-grade natural gas. Sour fuel gas is contacted with sodium hydroxide to remove sulfur compounds as solid sodium hydrosulfide. Gas from this unit will have 200-500 ppm H_2S, but it cannot be burned in a unit subject to NSPS Subpart J unless its sulfur content is reduced to 160 ppm. The stream is split into two portions, with one going to a diethanolamine (DEA) contactor for sulfur removal, while the other goes to a glycol dehydrator.

There are three boilers at the facility. These boilers are designated Boiler #4, Boiler #5, and Wickes Steam Boiler 1-B-8. The Wickes Boiler was converted from being the FCCU waste heat recovery boiler to being a dual-fueled boiler in 1979. It is now fueled exclusively by fuel gas.

Three flares are present at the facility. The south flare burns releases from relief systems and vents in the Crude Units, Crude Vacuum Units, Hydrocracker Unit, Hysomer Unit, No. 1 Naphtha Splitter, No. 2 Naphtha Splitter, Merox treater, ROSE Unit, RFG Unit, and miscellaneous units located at the south end of the facility. There are two North Flares, the new ("Peabody") flare installed in 1991 and a back-up flare. These flares burn releases from the Naphtha Unifiner Unit, CCR Platformer, FCCU, Deisobutanizer Unit, Plat Depropanizer Unit, Alkylation Unit, LPG loading rack, and pressure tanks for propane, butane, and olefins. The new flare is designed to process 150,000 lb/hr. Excess pressure diverts additional hydrocarbons to the back-up flare.

Wastewater is collected throughout the refinery. The most significant source is the crude oil desalters, where oily water is separated from crude oil. Various units generate additional wastewater with varying degrees of oil content. The refinery segregates stormwater that falls outside the process areas into a separate wastewater system that discharges through a permitted stormwater outfall. Stormwater that falls in process areas is not collected in separate sewers, but some units do preliminary oil-water separation prior to discharging into integrated sewers. There is an initial oil-water separator adjacent to the Crude Desalter and another one adjacent to the Crude Unit, Hydrocracker, and Platformer. Oily water proceeds to an API separator then to an Activated Sludge unit. Sludge is periodically collected and dewatered for shipment off-site, while water continues to clarifiers and lagoons, and eventually to the Washita River.

Those wastewater handling units which are subject to NSPS Subpart QQQ are grouped as Emission Unit Group No. 57.

D. Blending and Product Loading Operations

Equipment is present for shipping or receiving several hydrocarbon products: LPG, gas oil, asphalt, propylene, isobutane, n-butane, gasoline, jet fuel (JP-8), and diesel. LPG, gas oil, propylene, and butanes are both bought and sold by the refinery, depending on market conditions, short-term excesses, etc. Sodium hydrosulfide is also loaded as an aqueous solution and slurry.

Gasoline blending is done on a batch basis using large tanks. The several components are metered into the tanks. The tanks perform dual roles, both as process equipment and storage equipment.

Gasoline products are sold by either pipeline or truck. The truck loading rack is equipped with a vapor recovery unit to recover the hydrocarbon vapors displaced out of the mobile tanks loaded.

SECTION III: PROJECT DESCRIPTION

The applicant proposes to install an electrostatic precipitator on the discharge stack from the FCCU catalyst regenerator to control PM emissions. PM emissions were shown by stack testing to exceed current permit limitations. Those limitations were established by the unit's operating permit in 1982 to keep added PM emissions below PSD levels of significance.

In 1978, a project was commenced to allow the refinery to produce primarily unleaded gasoline, part of EPA's phase-out of leaded gasoline. The overall project involved five units:

- The fluid catalytic cracking unit (FCCU) was expanded from a capacity of 12,500 BPD to 21,000 BPD.
- The distillate unifiner was expanded from a capacity of 4,000 BPD to a capacity of 6,500 BPD.
- The naphtha unifiner was expanded from a capacity of 5,500 BPD to a capacity of 9,000 BPD.
- The platformer was expanded from a capacity of 7,000 BPD to a capacity of 8,500 BPD.
- a Residual Oil Supercritical Extraction (ROSE) unit was constructed; supporting the unit was a 13 MMBTUH refinery fuel gas (RFG) fired heater.

One new heater was constructed, H-601 (13 MMBTUH). Although this unit was constructed in 1978, it was included in Permit No. 89-018-O for Wynnewood's continuous catalyst regenerator. Since the unit is covered under a different permit, it will not be analyzed further.

Part of the project was altering an existing "CO Boiler." The unit was originally designed to utilize latent heat from exhaust gases from the FCCU catalyst regenerator, and to burn CO in those gases, for the production of steam. The boiler was removed from the catalyst regenerator exhaust stream to become a stand-alone boiler. Since the new FCCU regenerator provided complete CO combustion, the boiler was no longer needed to perform this function.

Despite the increase in loading on the modified units, the previous owner (Kerr-McGee) stated that heat loadings on supporting heaters would **decrease**. This was attributed to added heat exchange area which enhanced efficiency. Both AQD and EPA reviewed this conclusion and concurred, although the files do not include any evaluation which indicates their reasoning.

Permits No. 78-051-C and 78-051-O were issued so that Kerr-McGee netted out from other PSD requirements. Permit No. 78-051-C specified a PM emissions limitation of 46 TPY, where Permit No. 78-051-O specified a PM emissions limitation of 123 TPY. The permit specified NOx and SO_2 emissions limitations by incorporating by reference the permit application into the permit. Only changes in SO_2 emissions resulting from RFG combustion were evaluated; no reference was made to SO_2 emissions resulting from coke burn-off in the catalyst regenerator despite increasing the FCCU's capacity by 60%. No evaluation of emissions of CO and VOC was performed.

Concurrent with the refinery expansion was a project to install a unit to remove sulfur compounds from the refinery fuel gas supply. It had been determined that Kerr-McGee needed to reduce sulfur content of the fuel gas by 79% to achieve compliance with the ambient standards for SO_2. Kerr-McGee installed a sodium hydrosulfide ("NaSH") unit wherein H_2S is reacted with sodium hydroxide (NaOH). The unit was intended to reduce H_2S content of the RFG from 1.95% to 0.2% (2,000 ppm). This reduction of fuel sulfur achieved compliance with the ambient impacts standards while producing additional SO_2 emissions reductions of 2,570 TPY.

SECTION IV. EMISSIONS

FCCU emissions were based on the following emission factors, with "coke burn-off" based on a refinery correlation (i.e., not directly measured).

- PM_{10}: limitations were equivalent to the NSPS Subpart J limitation of 1 lb PM per 1,000 lbs coke burn-off.
- SO_2: limitations were based on the coke burn-off correlation and a predicted maximum sulfur content of 1.05% by weight in the coke.
- NOx: emissions were calculated based on the AP-42 factor of 71 lb per 1,000 bbl. fresh feed.

Emissions factors for CO and VOC were stated as "negligible" when a CO boiler was utilized. The full high-temperature regenerator is expected to be at least as efficient as a secondary combustor for elimination of CO and VOC emissions.

Permit No. 78-051-C stated that NOx emissions were expected to decrease as a result of the project. Elimination of a CO boiler and restructuring secondary combustion with controlled (lower) levels of excess air was expected to more than offset the increased NOx emissions from increased throughput. Since NOx emissions decreased from a "grandfathered" unit, it was not "modified," therefore not subject to having emission limitations established.

EUG 85 – FCCU Regenerator

Point ID	Emission Unit	PM_{10}		SO_2		NOx		VOC		CO	
		lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
P-1ME258	FCCU regenerator	110.0	481.80	437.40	1916.00	62.12	272.1	--	--	--	--

Netting was unsophisticated by current standards. The project was commenced and completed prior to promulgation of the PM_{10} standards. VOC emissions estimates were not prepared for fugitive emissions from pumps, valves, flanges, drains, etc.; emissions factors for drains were not available until 1987, and emission factors for valves, flanges, pumps, etc., were not available until 1983. The net decrease in CO emissions was not calculated, sizable as it was owing to higher-temperature equipment, nor was the respective decrease in VOC emissions accompanying the CO emissions decrease calculated.

EMISSIONS NETTING

Emission Changes	SO_2	PM_{10}	
		Year 2000	Year 2003
1978 Pre-Project Actual Emissions	753.8	130	130
Post-Project Emissions	1916.0	482	67.5
Fuel Gas System Revisions	-2570.0	--	--
NET EMISSION CHANGES	-1407.8	352	-62.5
PSD Levels of Significance	40	15	15

Estimates of toxic emissions from the FCCU were prepared by analyzing the spent catalyst and proportioning total emission rates. Estimates are listed on the following page.

HAZARDOUS AND TOXIC AIR POLLUTANTS

Toxic	CAS Number	Toxicity Class	Emissions		MAAC ug/m^3
			lb/hr	TPY	
Aluminum Oxide	1334281	C	22.00	96.36	1000
Antimony *	7440360	B	0.079	0.303	10
Barium *	7440393	B	ND	ND	10
Chromium *	7440473	A	ND	ND	0.25
Cobalt *	7440484	A	ND	ND	0.5
Lead *	7439921	--	0.011	0.046	--
Manganese *	7439965A	C	ND	ND	500
Molybdenum	7439987	C	ND	ND	1000
Nickel *	7440020	A	0.240	1.053	0.15
Silica		A	36.24	158.73	20
Vanadium *	7440622	A	0.405	1.774	0.5
Zinc	1314132	C	0.234	1.025	500
Zirconium oxide	1314234	C	ND	ND	500

ND = not detected.
* HAPs under Title III.

SIGNIFICANT DISCHARGE POINT

Point ID	Description	Height Feet	Diameter Inches	Flow Rate ACFM	Temp. °F
P-1ME258	FCCU Regenerator	140	60	104,179	650

SECTION V. BEST AVAILABLE CONTROL TECHNOLOGY

BACT was analyzed using the "top-down" approach. PM_{10} may be controlled by a variety of technologies: baghouses, electrostatic precipitators, wet scrubbers, and cyclonic separators.

The application proposes an electrostatic precipitator as BACT. A control efficiency of at least 97% is anticipated, and control efficiency may exceed 99.9%. Since ESPs are recognized as the most effective PM controls, no further BACT analysis is needed. The level of control shown in the application is equal to the proposed MACT for petroleum refinery FCCUs. Since MACT is considered at least as stringent as BACT, installation of an ESP is acceptable as BACT for the FCCU catalyst regenerator.

SECTION VI. AIR QUALITY IMPACTS

The facility has conducted air dispersion modeling for PM_{10} emissions using the ISCST3 model. The new and modified emissions points were input to the ISCST3 model. Oklahoma City 1988-92 meteorological data were used. A fine-grid receptor network was used, placing receptors in a 100-meter grid around the refinery property to a distance of 1.5 km from the property line, and a 500-meter grid from 1.5 km to 5 km from the property lines. Receptor elevations were taken from US Geologic Survey "Digitized Elevation Models." Regulatory default options for the model were used in all cases.

The "20-D" Rule was used to exclude insignificant sources from modeling. The Louisiana 20-D rule allows exclusion of any source if 20 times the distance in kilometers between the two sources is greater than the emissions of the remote source expressed in TPY. There were no significant sources within the radius of impact plus 50 kilometers.

Building downwash was calculated using the Trinity "BREEZE-WAKE" program, which incorporates the EPA "Building Profile Input Parameters" methodology.

The refinery is located in the southern part of Wynnewood at an elevation of 850 feet above sea level in an area characterized by rolling terrain. The highest terrain within a 3 km radius is 910 feet in elevation, or below the stack height.

To complete the NAAQS analysis, the maximum potential emission rates for all Wynnewood Refinery emission units are calculated. The emissions modeled are those based on existing federally enforceable limitations. The facility-wide emissions are combined with the maximum potential emissions of all nearby sources screened into the analysis and are then modeled.

Total air pollutant concentrations are calculated as the sum of facility impacts, all nearby significant source impacts, and background concentrations. Background concentrations as recorded for Lawton, Oklahoma were used; Lawton is the closest air monitoring site in a rural area to Wynnewood which itself is also in a rural area. The resulting maximum impacts are compared with the applicable NAAQS to demonstrate compliance.

As shown through the following tables, ambient impacts from the several modifications are below NAAQS and increment standards. Thus it has been demonstrated that the plant with the several modifications does not cause nor contribute to an air quality standards violation.

NAAQS COMPLIANCE

Pollutant	Maximum Modeled Impacts, ug/m^3		Background Concentration, ug/m^3	Total Impacts, ug/m^3		NAAQS, ug/m^3
	Pre-Project	Post-Project		Pre-Project	Post-Project	
PM_{10}	9.16 (24-hrs)	2.02 (24-hrs)	54 (1)	63.16 (24-hrs)	56 (24-hrs)	150
	2.27 (annual)	0.25 (annual)	28 (1)	30.27 (annual)	28.25 (annual)	50

(1) Background concentrations as listed for Lawton for 1998

INCREMENT COMPLIANCE

Pollutant	Maximum Modeled Impacts, ug/m^3		Ambient Levels of Significance, ug/m^3	Radius Of Impact, km		PSD Increments, ug/m^3
	Pre-Project	Post-Project		Pre-Project	Post-Project	
PM_{10}	9.16 (24-hrs)	2.02 (24-hrs)	5	3.5 (24-hrs)	0 (24-hrs)	37
	2.27 (annual)	0.25 (annual)	1	3.5 (annual)	0 (annual)	17

COMPARISON OF INCREMENT TO AMBIENT MONITORING LEVELS OF SIGNIFICANCE

Pollutant	Modeled Incremental Impacts, ug/m^3	Monitoring Levels of Significance, ug/m^3	Post-Construction Monitoring Required?
PM_{10}	9.16 (24-hrs)	10 (24-hrs)	No

HAZARDOUS AND TOXIC AIR POLLUTANTS

Toxic	CAS Number	Toxicity Class	Ambient Impacts, ug/m^3	MAAC ug/m^3
Aluminum Oxide	1334281	C	2.88	1000
Nickel	7440020	A	0.031	0.15
Silica	63231674	A	4.75	20
Vanadium	7440622	A	0.052	0.5

SECTION VII. OTHER PSD ANALYSES

Growth Impacts

No significant industrial or commercial secondary growth occurred as a result of the project. Only a nominal number of new jobs were created at the new facility and these were filled by the local work force in the immediate area. No significant population growth occurred. Only a minimal air quality impact is expected as a result of associated secondary growth.

Soils, Vegetation, and Visibility

There are two portions to a visibility analysis: impacts near the facility and impacts on Class I areas. The applicant has conducted a visibility impact analysis in accordance with guidelines in the Workbook for Estimating Visibility Impairment (EPA-450/ 4-80-031) using EPA's software VISCREEN. A Level 1 screening analysis was performed for the facility's impact at a range of 1 km. Since some contrast parameters exceeded Level I screening parameters, the analysis proceeded to Level 2. The only scenario which exceeded allowable contrast parameters was for an observer looking into the sun, the sun being 10° above the horizon, and viewing terrain background. Since there is no terrain above stack height within 3 kilometers, this scenario is impossible. It is concluded that there will be no significant visual impairment in the vicinity of the refinery.

No effect on soils is anticipated from the facility. The particulate matter is primarily silicon dioxide. This is already among the major constituents of the local soils.

Impact On Class I Areas

The nearest Class I area is the Wichita Mountains Wildlife Refuge, about 130 km (80 miles) from the facility at nearly a 70° angle to the prevailing winds. The two important tests for impaction on a Class I area are visibility impairment and ambient air quality effect. A visibility analysis in the previous section indicated no impairment of visibility for this area. A significant air quality impact is defined as an ambient concentration increase of 1 ug/m^3, 24 hour average. The radius of impact is 3.5 km (based on the 1 ug/m^3 level of significance), or 126 km from the Class I area. The extended transport distance to the nearest Class I area precludes any significant air quality impact from the facility.

SECTION VIII. OKLAHOMA AIR POLLUTION CONTROL RULES

OAC 252:100-1 (General Provisions) [Applicable]
Subchapter 1 includes definitions but there are no regulatory requirements.

OAC 252:100-3 (Air Quality Standards and Increments) [Applicable]
Primary Standards are in Appendix E and Secondary Standards are in Appendix F of the Air Pollution Control Rules. At this time, all of Oklahoma is in attainment of these standards.

OAC 252:100-4 (New Source Performance Standards) [Applicable]
Federal regulations in 40 CFR Part 60 are incorporated by reference as they exist on July 1, 2000, except for the following: Subpart A (Sections 60.4, 60.9, 60.10, and 60.16), Subpart B, Subpart C, Subpart Ca, Subpart Cb, Subpart Cc, Subpart Cd, Subpart Ce, Subpart AAA, and Appendix G. These regulations are discussed in Section IX, "Federal Regulations."

OAC 252:100-5 (Registration, Emission Inventory, and Annual Fees) [Applicable]
The owner or operator of any facility that is a source of air emissions shall submit a complete emission inventory annually on forms obtained from the Air Quality Division. An emission inventory was submitted and fees paid for previous years as required.

OAC 252:100-7 (Permits for Minor Facilities) [Not Applicable]
Subchapter 7 sets forth the permit application fees and the basic substantive requirements for permits for minor facilities. However, Subchapter 7 previously contained the requirements for construction and operation of major sources also. The facility has been issued numerous permits since promulgation of the permitting rule (October, 1972). The requirements of the several permits will be incorporated into the Title V permit.

OAC 252:100-8 (Permits for Part 70 Sources) [Applicable]
Part 5 includes the general administrative requirements for part 70 permits. Any planned changes in the operation of the facility which result in emissions not authorized in the permit and which exceed the "Insignificant Activities" or "Trivial Activities" thresholds require prior notification to AQD and may require a permit modification. Insignificant activities mean individual emission units that either are on the list in Appendix I (OAC 252:100) or whose actual calendar year emissions do not exceed the following limits:

- 5 TPY of any one criteria pollutant
- 2 TPY of any one hazardous air pollutant (HAP) or 5 TPY of multiple HAPs or 20% of any threshold less than 10 TPY for single HAP that the EPA may establish by rule
- 0.6 TPY of any one Category A toxic substance
- 1.2 TPY of any one Category B toxic substance
- 6.0 TPY of any one Category C toxic substance

The permit will only establish limits for the FCCU regenerator based on information in the permit application. A construction permit is required because this is considered a significant modification.

OAC 252:100-9 (Excess Emission and Malfunction Reporting Requirements) [Applicable]
In the event of any release which results in excess emissions, the owner or operator of such facility shall notify the Air Quality Division as soon as practical during normal office hours and no later than the next working day following the malfunction or release. Within ten (10) business days further notice shall be tendered in writing containing specific details of the incident. Part 70 sources must report any exceedance that poses an imminent and substantial danger to public health, safety, or the environment as soon as is practicable; but under no circumstances shall notification be more than 24 hours after the exceedance.

OAC 252:100-13 (Prohibition of Open Burning) [Applicable]
Open burning of refuse and other combustible material is prohibited except as authorized in the specific examples and under the conditions listed in this subchapter.

OAC 252:100-19 (Particulate Matter) [Applicable]
Subchapter 19 limits PM emissions from various processes which are both process and fuel-burning equipment. Limitations are specified based on process weight rate. The process weight at the FCCU is the sum of the catalyst circulation rate (up to 800 TPH) plus the gas oil charge rate. Assuming a specific gravity of 1.05 and a feed rate up to 833 BPH, a gas oil feed rate of 153 TPH is calculated for a total process weight rate of 953 TPH. The allowable PM emission rate is 77.0 lb/hr based on this process weight rate. The anticipated post-project PM emissions rate from the FCCU (15.4 lb/hr) is in compliance with Subchapter 19. The current emission rate (110 lb/hr) is not in compliance with Subchapter 19, but this permit incorporates plans to achieve compliance.

OAC 252:100-25 (Visible Emissions and Particulates) [Not Applicable]
No discharge of greater than 20% opacity is allowed except for short-term occurrences which consist of not more than one six-minute period in any consecutive 60 minutes, not to exceed three such periods in any consecutive 24 hours. In no case shall the average of any six-minute period exceed 60% opacity. Subchapter 25 specifies that any unit subject to an opacity limitation of NSPS is not affected by its limitations.

OAC 252:100-29 (Fugitive Dust) [Applicable]
Subchapter 29 prohibits the handling, transportation, or disposition of any substance likely to become airborne or windborne without taking "reasonable precautions" to minimize emissions of fugitive dust. No person shall cause or permit the discharge of any visible fugitive dust emissions beyond the property line on which the emissions originate in such a manner as to damage or to interfere with the use of adjacent properties, or cause air quality standards to be exceeded, or to interfere with the maintenance of air quality standards. Most facility roads are paved, and FCCU catalyst handling equipment is enclosed. These measures achieve compliance with the "reasonable precautions" requirement.

OAC 252:100-31 (Sulfur Compounds) [Applicable]

Part 3 regulates the emissions of sulfur compounds from stationary sources and establishes short-term ambient standards for SO_2 and H_2S. The ambient air quality modeling summarized in this memorandum demonstrates compliance with the SO_2 standards. Connecting the Crude Units vents to the fuel gas system to achieve compliance with the MACT eliminated most of the H_2S emissions from the facility. Modeling of SO_2 impacts is currently being conducted for the facility Title V operating permit.

OAC 252:100-33 (Nitrogen Oxides) [Not Applicable]

Subchapter 33 affects new fuel-burning equipment with a rated heat input of 50 MMBTUH or more. The catalyst regenerator operates by adding air to off-gases which are already at 1,400°F. This type of unit does not meet the definition of "fuel-burning equipment": "any one or more of boilers, furnaces, gas turbines or other combustion devices and all appurtenances thereto used to convert fuel or waste to usable heat or power." Combustion of coke eliminates the coke from the catalyst but does not generate usable heat or power by that combustion.

OAC 252:100-35 (Carbon Monoxide) [Applicable]

Subchapter 35 affects the refinery catalytic cracking unit (FCCU). Subchapter 35 requires "complete" secondary combustion, which is defined in the rule as 93% or more. The regeneration system is anticipated to provide at least 98% control of CO emissions, which is in compliance with Subchapter 35.

OAC 252:100-37 (Volatile Organic Compounds) [Applicable]

Part 3 affects storage tanks constructed after December 28, 1974, with a capacity of 400 gallons or more and storing a VOC with a vapor pressure greater than 1.5 psia. There are no storage tanks involved in this permit.

Part 3 applies to VOC loading facilities constructed after December 24, 1974. Although the refinery has a loading terminal, it is not subject to this permit.

Part 5 limits the VOC content of coatings used in coating lines or operations. This facility does not normally conduct coating or painting operations except for routine maintenance of the facility and equipment which is exempt.

Part 7 requires all VOC gases from a vapor recovery blowdown system to be burned by a smokeless flare or equally effective control device unless it is inconsistent with the "Minimum Federal Safety Standards for the Transportation of Natural and Other Gas by Pipeline" or any State of Oklahoma regulatory agency.

Part 7 requires fuel-burning equipment to be operated and maintained so as to minimize emissions of VOCs. Temperature and available air must be sufficient to provide essentially complete combustion. The FCCU regenerator is operated to minimize emissions of VOC.

Part 7 requires effluent water separators openings or floating roofs to be sealed or equipped with an organic vapor recovery system. The product recovery condensers are not part of this permit.

Part 7 also requires all reciprocating pumps and compressors to be equipped with packing glands that are properly installed and maintained in good working order and rotating pumps and compressors to be equipped with mechanical seals. Packing glands are periodically inspected and maintained as necessary.

OAC 252:100-41 (Hazardous and Toxic Air Contaminants) [Applicable]

Part 3 addresses hazardous air contaminants. NESHAP, as found in 40 CFR Part 61, are adopted by reference as they exist on July 1, 2000, with the exception of Subparts B, H, I, K, Q, R, T, W and Appendices D and E, all of which address radionuclides. In addition, General Provisions as found in 40 CFR Part 63, Subpart A, and the Maximum Achievable Control Technology (MACT) standards as found in 40 CFR Part 63, Subparts F, G, H, I, L, M, N, O, Q, R, S, T, U, W, X, Y, CC, DD, EE, GG, HH, II, JJ, LL, KK, OO, PP, QQ, RR, SS, TT, UU, VV, WW, YY, CCC, DDD, EEE, GGG, HHH, III, JJJ, LLL, MMM, NNN, OOO, PPP, RRR, TTT, VVV, and XXX are hereby adopted by reference as they exist on July 1, 2000. These standards apply to both existing and new sources of HAPs. These requirements are addressed in the Federal Regulations Section.

Part 5 is a **state-only** requirement governing toxic air contaminants. New sources (constructed after March 9, 1987) emitting any category "A" pollutant above de minimis levels must perform a BACT analysis, and if necessary, install BACT. All sources are required to demonstrate that emissions of any toxic air contaminant which exceeds the de minimis level do not cause or contribute to a violation of the MAAC. A demonstration of compliance with the MAAC was included in Section VI: "Air Quality Impacts."

The following Oklahoma Air Pollution Control Rules are not applicable to this project:

OAC 252:100-11	Alternative Emissions Reduction	not requested *
OAC 252:100-15	Mobile Sources	not in source category
OAC 252:100-17	Incinerators	not type of emission unit
OAC 252:100-23	Cotton Gins	not type of emission unit
OAC 252:100-24	Grain Elevators	not in source category
OAC 252:100-39	Nonattainment Areas	not in area category
OAC 252:100-47	Landfills	not in source category

* A "bubble permit" was issued for construction of a sulfur recovery unit, Permit No. 92-098-C. This permit has expired without the unit ever being constructed.

SECTION IX. FEDERAL REGULATIONS

PSD, 40 CFR Part 52 [Applicable]

Total added emissions of PM_{10} are greater than the level of significance of 15 TPY for an existing PSD source. This permit incorporates the requirements of PSD: a BACT analysis, an analysis showing compliance with NAAQS, an analysis showing compliance with increment consumption, an analysis of effects on population growth, soils, vegetation, visibility, and Class I area impacts.

NSPS, 40 CFR Part 60 [Subpart J Applicable]

Subpart J (Petroleum Refineries) applies to the following affected facilities in petroleum refineries: fluid catalytic cracking unit catalyst regenerators, fuel gas combustion devices, and Claus sulfur recovery plants. All fluid catalytic cracking unit catalyst regenerators which commence construction or modification after June 11, 1973, are subject to the following limitations:

- a PM emission limitation of 0.1 lb/1,000 lbs of coke burn-off;
- an opacity limitation of 30 percent which is required to be continuously monitored and recorded; and
- a CO emission limitation of 500 ppm by volume on a dry basis which is required to be continuously monitored and recorded.

Subpart GGG (Equipment Leaks of VOC in Petroleum Refineries) affects each valve, pump, pressure relief device, sampling connection system, open-ended valve or line, and flange or other connector in VOC service at a process unit which commenced construction or modification after January 4, 1983, and which is located at a petroleum refinery. Modifications to the FCCU were conducted prior to the effective date of Subpart GGG.

NESHAP, 40 CFR Part 61 [Applicable]

Subpart FF (Benzene-Contaminated Waste Operations) affects wastewater treatment systems at petroleum refineries where benzene content of wastewaters exceed 1.0 metric ton per year. Those refineries whose benzene content is between 1.0 and 10.0 metric tons per year are required only to analyze the wastewaters for the presence of benzene to demonstrate that the amount of benzene in wastewater at the refinery is less than 10.0 TPY. The Title V application included an analysis of wastewater streams showing a benzene content of 4.81 metric tons in 1997.

NESHAP, 40 CFR Part 63 [Not Applicable]

Subpart CC (Petroleum Refineries) establishes MACT standards for control of HAPs from petroleum refineries. Subpart CC affects process vents (except FCCUs and catalyst regenerators) with HAP concentrations exceeding 20 ppm, storage vessels, wastewater streams and treatment, equipment leaks, gasoline loading racks, marine vessel loading systems, and pipeline breakout stations. The FCCU is excluded for the units subject to Subpart CC.

Subpart UUU, Petroleum Refineries – Catalytic Cracking (Fluid and Other) Units, Catalytic Reforming Units, and Sulfur Plants. This draft subpart, published on September 11, 1998, affects the following:

- Process vents on each catalytic cracking unit that is associated with regeneration of the catalyst.
- Process vents on each catalytic reforming unit that is associated with regeneration of the catalyst.
- Process vents that vent from a Claus or other type of sulfur recovery plant unit or the tail gas treatment unit.

Based on the draft subpart, fluidized-bed catalytic cracking unit catalyst regenerators complying with NSPS, Subpart J, and all associated requirements are in compliance with this Subpart (§§ 63.1562(a)(1) and 63.1562(a)(2)).

Compliance Assurance Monitoring, 40 CFR Part 64 [Applicable]
Compliance Assurance Monitoring, as published in the Federal Register on October 22, 1997, applies to any pollutant specific emission unit at a major source, that is required to obtain a Title V permit, if it meets all the following criteria:

- It is subject to an emission limit or standard for an applicable regulated air pollutant.
- It uses a control device to achieve compliance with the applicable emission limit or standard.
- It has potential emissions, prior to the control device, of the applicable regulated air pollutant of 100 TPY.

The FCCU regenerator will use a control device to achieve compliance with the applicable PM emission limit. Potential PM emissions are greater than 100 TPY after control and the CAM requires large pollutant-specific emission units which are affected by significant modifications to submit information required by the CAM. Therefore, information for the CAM shall be required to be submitted as a Title V operating permit update.

Chemical Accident Prevention Provisions, 40 CFR Part 68 [Applicable]
Toxic and flammable substances subject to this regulation are present in the facility in quantities greater than the threshold quantities. A Risk Management Plan was submitted to EPA on June 17, 1999, and was determined to be complete.

Stratospheric Ozone Protection, 40 CFR Part 82 [Applicable]
This facility does not produce, consume, recycle, import, or export any controlled substances or controlled products as defined in this part, nor does the facility perform service on motor (fleet) vehicles which involves ozone-depleting substances. Therefore, as currently operated, this facility is not subject to these requirements. To the extent that the facility has air-conditioning units that apply, the permit requires compliance with Part 82.

SECTION X. COMPLIANCE

Compliance Plans

The facility has entered into a Consent Order with ODEQ to resolve various issues of non-compliance. Requirements of the CO are summarized on the following page.

a. request bids for the engineering and design and delivery times of major equipment
b. retain contractor to engineer and design the selected control technology
c. request bids for the construction/installation of the selected control technology
d. award contracts to construct/ install the selected control technology
e. prepare a construction/installation schedule and submit this to DEQ/AQD for review and approval. The schedule shall contain projected milestone dates for the following:
    1. delivery of major equipment
    2. infrastructure and support facilities construction
    3. construction of selected control technology to be 50% completed
    4. construction of selected control technology to be 75% completed
    5. construction of selected control technology to be 100% completed
a. selected control technology to be on-line no later than December 31, 2002
b. stack testing within 30 days of controls being on-line using Method 5F
c. report within 30 days of testing

These will be incorporated into the Title V permit.

Tier Classification and Public Review

This application has been determined to be a **Tier II** based on the request for a significant modification to a major source facility. The applicant published the "Notice of Filing a Tier II Application" in the *Wynnewood Gazette*, a weekly newspaper of general circulation in Garvin County, on April 23, 1999. The notice said that the application was available for public review at the Wynnewood Public Libarary, 108 Dean A. McGee Ave., Wynnewood, Oklahoma or at the Oklahoma City AQD office. A draft of this permit was also made available for public review for a period of thirty days as stated in another newspaper announcement on March 15, 2001, in the *Wynnewood Gazette*. The facility is located within 50 miles of the border with the state of Texas; that state was notified of the draft permit. No comments were received from the public, EPA, or the state of Texas.

The applicant has submitted an affidavit that they are not seeking a permit for land use or for any operation upon land owned by others without their knowledge. The affidavit certifies that the applicant owns the property.

Information on all permit actions is available for review by the public in the Air Quality section of the DEQ Web page:*http://www.deq.state.ok.us/*

Fees Paid

Major source initial operating permit fee of $2000.

SECTION XI. SUMMARY

Except as noted in Section X, "Compliance," the applicant has demonstrated the ability to achieve compliance with applicable state and federal ambient air quality standards and air pollution control rules and regulations. There are no active Air Quality compliance or enforcement issues that would affect the issuance of this permit. Issuance of the permit is recommended.

PERMIT

AIR QUALITY DIVISION
STATE OF OKLAHOMA
DEPARTMENT OF ENVIRONMENTAL QUALITY
707 N. ROBINSON STREET, SUITE 4100
P.O. BOX 1677
OKLAHOMA CITY, OKLAHOMA 73101-1677

Date _____ **Permit No.** 1998-117-C (PSD)

Wynnewood Refining Company, **having complied with the requirements of the law, is hereby granted permission to** construct an electrostatic precipitator on the FCCU catalyst regenerator discharge at their petroleum refinery at Wynnewood, Garvin County, Oklahoma,

subject to the following conditions, attached:

[X] Standard Conditions

[X] Specific Conditions

_____ **Director, Air Quality Division**

DEQ Form 885
Revised 7/93

PERMIT TO CONSTRUCT
AIR POLLUTION CONTROL FACILITY
SPECIFIC CONDITIONS

Wynnewood Refining Company
Wynnewood Refinery **Permit No. 1998-117-C (PSD)**

The permittee is authorized to construct in conformity with the specifications submitted to Air Quality on August 31, 2000, with supplemental information received December 15 and December 19, 2000. The Evaluation Memorandum dated April 16, 2001, explains the derivation of applicable permit requirements and estimates of emissions; however, it does not contain limitations or permit requirements. Commencing construction or operations under this permit constitutes acceptance of, and consent to the conditions contained herein:

1. Emissions limitations and operational requirements: [OAC 252:100-8-6(a)(1)]

A. The following emission limitations shall apply until December 31, 2002:

Point ID	Emission Unit	PM_{10}		SO_2	
		lb/hr	TPY	lb/hr	TPY
P-1ME258	FCCU regenerator	110.00	481.80	437.40	1916.00

B. After December 31, 2002, the following emission limitations shall apply:

Point ID	Emission Unit	PM_{10}		SO_2	
		lb/hr	TPY	lb/hr	TPY
P-1ME258	FCCU regenerator	15.4	67.5	437.40	1916.00

C. The FCCU catalyst regenerator shall comply with all applicable requirements of NSPS Subpart J. [40 CFR 60.100 to 40 CFR 60.109]

1. The FCCU catalyst regenerator shall not emit CO in excess of 500 ppm (dry-basis). [40 CFR 60.103(a)]
2. PM shall not be discharged in excess of 1 lb per 1,000 pounds coke burn-off. [40 CFR 60.102(a)(1)]
3. Opacity of emissions shall be continuously monitored and recorded. [40 CFR 60.105(a)(1)]
4. Except as provided in Item 5, CO emissions shall be continuously monitored and recorded. [40 CFR 60.105(a)(2)]
5. If the permittee can demonstrate that average CO emissions are less than 50 ppm (dry-basis) for 30 days, the permittee may apply for a waiver of continuous CO monitoring. [40 CFR 60.105(a)(2)(ii)]

2. The permittee shall be authorized to operate the facility continuously (24 hours per day, every day of the year). [OAC 252:8-6(a)]

3. Records of operations shall be maintained on site for at least five years after the date of recording and shall be provided to regulatory personnel upon request. [OAC 252:8-6(a)(3)(b)]

A. Opacity of FCCU catalyst regenerator emissions (continuous when operating)
B. Records of FCCU CO emissions (continuous when operating)

4. This permit supersedes Permit No. 78-051-O (M-3), which is now null and void.

5. Within 30 days of issuance of this permit, the permittee shall specify dates for compliance with the following Increments of Progress as specified herein. These dates shall be subject to *force majure* provisions of Consent Order No. 99-400. [OAC 252:8-6(a)(3)(b)]

A. Request bids for the engineering and design and delivery times of major equipment

B. Retain contractor to engineer and design the selected control technology

C. Request bids for the construction/installation of the selected control technology

D. Award contracts to construct/ install the selected control technology

E. Prepare a construction/installation schedule and submit this to DEQ/AQD for review and approval. The schedule shall contain projected milestone dates for the following:

i. delivery of major equipment
ii. infrastructure and support facilities construction
iii. construction of selected control technology to be 50% completed
iv. construction of selected control technology to be 75% completed
v. construction of selected control technology to be 100% completed.

F. Selected control technology to be on-line no later than December 31, 2002

G. Stack testing within 30 days of controls being on-line using Method 5F

H. Stack testing results report within 30 days of testing

6. Within 30 days of operational start-up of the new electrostatic precipitator, the permittee shall conduct performance testing of PM emissions from the FCCU catalyst regenerator. A written report documenting compliance with applicable limitations shall be submitted within 30 days of completion of field testing. Performance testing by the permittee shall use the following test methods specified in 40 CFR Part 60. [OAC 252:100-45]

Method 1: Sample and Velocity Traverses for Stationary Sources.

Method 2: Determination of Stack Gas Velocity and Volumetric Flow Rate.

Method 3: Gas Analysis for Carbon Dioxide, Excess Air, and Dry Molecular Weight.

Method 4: Determination of Moisture in Stack Gases.

Method 5 or 5F: Determination of Particulate Matter Emissions from Stationary Sources.

Method 7E: Determination of NOx Emissions from Stationary Sources

Method 9: Visual Determination of Opacity

Method 25A: Determination of VOC Emissions from Stationary Sources

Method 10: Measurement CO Emissions from Stationary Sources

Opacity testing shall be conducted for a minimum of 30 six-minute averages.

Performance testing shall be conducted while the FCCU is operating within 10% of the rates at which operating permit authorization will be sought.

Wynnewood Refining Company
Attn.: Chris Hawley
P. O. Box 305
Wynnewood, Oklahoma 73098

SUBJECT: Permit Application No. **1998-117-C (PSD)**
Petroleum Refinery FCCY
Wynnewood, Garvin County

Dear Mr. Hawley:

Enclosed is the permit authorizing construction of the referenced facility. Please note that this permit is issued subject to certain standards and specific conditions which are attached.

Thank you for your cooperation in this matter. If we may be of further service, please contact our office at (405) 702-4100.

Very truly yours,

David S. Schutz, P.E.
New Source Permits Unit
AIR QUALITY DIVISION

Enclosures

cc: Garvin County DEQ Office